



Economic Analysis of the Proposed Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category



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EXECUTIVE SUMMARY

ES.1 BACKGROUND

The U.S. Environmental Protection Agency (EPA) is proposing to revise effluent limitations guidelines and standards and subcategorization for the iron and steel manufacturing point source category. EPA first set regulations for the industry in 1974 and 1986. The current iron and steel rule, 40 CFR Part 420, was promulgated in May 1982 (EPA, 1982), and was amended in May 1984 as part of a Settlement Agreement among EPA, the iron and steel industry, and the Natural Resources Defense Council (EPA, 1984). In promulgating Part 420 in 1982, aside from the temporary central treatment exclusion for 21 specified steel facilities at 40 CFR 420.01(b), EPA provided no exclusions for facilities on the basis of age, size, complexity, or geographic location as a result of the remand issues. EPA also revised the subcategorization from that specified in the 1974 and 1976 regulations to more accurately reflect major types of production operations and to attempt to simplify implementation of the regulation by permit writers and the industry. As the industry continues to evolve, EPA is revising the guidelines and standards to remove references to obsolete technologies, include references to new technologies, and refine the industry subcategorization.

EPA is proposing Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), Pretreatment Standards for Existing Sources (PSES), New Source Performance Standards (NSPS), and Pretreatment Standards for New Sources (PSNS). This Economic Analysis (EA) summarizes the costs and economic impacts of technologies that form the bases for setting limits and standards for the iron and steel industry.¹

ES.2 INDUSTRY OVERVIEW

The United States is the third largest steel producer in the world with 12 percent of the market, an annual output of approximately 105 million tons per year, and nearly 145,000 employees. Major markets for steel are service centers and the automotive and construction industries. A service center is an operation that buys finished steel, processes it in some way, and then sells it. Together these three markets account for

¹The industry, however, is free to use whatever technology it chooses in order to meet the limit.

about 58 percent of steel shipments. The remaining 42 percent is dispersed over a wide range of products and activities, such as agricultural, industrial, and electrical machinery; cans and barrels; and appliances. The building of ships, aircraft, and railways and other forms of transport is included in this group as well.

The iron and steel effluent guideline would apply to approximately 254 iron and steel sites. Of these 254 sites, approximately 216 can be analyzed for post-regulatory compliance impacts at the site level. Based on EPA survey data (see next section), the 254 sites are owned by 115 companies and approximately 60 sites are owned by small business entities. The global nature of the industry is illustrated by the fact that 18 companies have foreign ownership. Twelve other companies are joint entities with at least one U.S. company partner. Excluding joint entities and foreign ownership, the data base contains 85 U.S. companies, more than half of which are privately owned. Responses to the EPA survey are the only sources of financial information for these privately-held firms.

The EPA survey collected financial data for the 1995-1997 time period (the most recent data available at the time of the survey). This three-year time frame marks a period of high exports (six to eight million tons per year). This high point in the business cycle allowed companies to replenish retained earnings, retire debt, and take other steps to reflect this prosperity in their financial statements. Even so, an initial analysis of the pre-regulatory condition of companies in the EPA survey indicated that twenty-seven of them would be considered “financially distressed” for reasons ranging from start-up companies and joint ventures to established firms that still showed losses.

The financial situation changed dramatically between 1997 and 1998 due to the Asian financial crisis and slow economic growth in Eastern Europe. When these countries’ currencies fell in value, their steel products fell in price relative to U.S. producers. While the U.S. is and has been the world’s largest steel importer (and a net importer for the last two decades), the U.S. was nearly the only viable steel market to which other countries could export during 1998. U.S. imports jumped by 13.3 million tons from 41 million to 54.3 million tons—a 32 percent increase—from 1997 to 1998. About one out of every four tons of steel consumed in 1998 was imported. At least partly due to increased competition from foreign steel mills, the financial health of the domestic iron and steel industry also experienced a steep decline after 1997. This decline is not reflected in the survey responses to the questionnaire, which covered the years 1995 through 1997 and which were the most recent data available at the time EPA administered the questionnaire in 1998. This decline, however, is incorporated in two of the three forecasting models, see Section ES.4.

ES.3 DATA SOURCES

EPA used its authority under Section 308 of the Clean Water Act to collect information not available otherwise, such as site-specific data, and financial information for privately-held firms and joint entities (called the *Collection of 1997 Iron and Steel Industry Data* or the “EPA Survey”). EPA could not use Census or industry data, such as the American Iron and Steel Institute’s annual statistics because both sources contain data for a mix of sites in two EPA categories: (1) iron and steel and (2) metal products and machinery. Hence, the survey is the only source for information crucial to the rulemaking process. Particularly for the post-1997 period, EPA supplemented the survey information with sources such as trade journal reports, Security and Exchange Commission filings, and trade case filings with the U.S. Department of Commerce and the U.S. International Trade Commission.

ES.4 ECONOMIC IMPACT METHODOLOGY

EPA considered nine major components for the Economic Analysis:

- # an assessment of the number of facilities that this rule could affect;
- # an estimate of the annualized aggregate cost for these facilities to comply with the rule using site-level capital, one-time non-capital, and annual operating and maintenance (O&M) costs;
- # a site-level closure analysis to evaluate the impacts of compliance costs for operations in individual subcategories at the site;
- # a second site-level closure analysis to evaluate the impacts of the combined cost of the options for all subcategories at the site;
- # an evaluation of the corporate financial distress incurred by the companies in the industry as a result of combined compliance costs for all sites owned by the company;
- # an industry-wide market analysis of the impacts of the compliance costs;
- # an evaluation of secondary impacts such as those on employment and economic output;
- # an analysis of the effects of compliance costs on small entities; and
- # a cost-benefit analysis pursuant to E.O. 12866.

The industry profile provides an estimate of the 254 sites potentially affected by the regulation.

A starting point for the rest of the economic analysis is a cost annualization model that calculates the present value and annualized cost of the capital, one-time non-capital, and operating and maintenance costs associated with each option for improved waste water treatment. The model incorporates company-specific cost of capital (discount rates) and tax rates. Tax shields are calculated according to IRS rules. The subcategory, site, company, and industry analyses use the cost outputs from the annualization model.

EPA developed a site closure model in which a site was considered closed as a result of the regulation if it showed a neutral to positive present value of future cash flows before the regulation and a negative value after the regulation. EPA developed three forecasting methods, two of which specifically addressed the post-1997 industry downturn and cyclicity in the industry. All methods incorporate a “no-real-growth assumption.” For the **subcategory** analysis, EPA ran the closure model with only the subcategory costs. For the **site** analysis, EPA aggregated the costs for upgrading all operations in all subcategories at the site and ran the closure model.

EPA reviewed the last ten years of economic literature to evaluate methods of identifying **corporate** financial distress and chose the Altman Z'-score model (a weighted average of financial ratios). EPA calculates the Z'-score for each company with the 1997 survey data to estimate pre-regulatory conditions. EPA recalculates the Z'-score after incorporating the effects of the pollution control costs into the balance sheet and income statement. All companies whose Z'-score changes from “good” or “indeterminate” in the pre-regulatory analysis to “distressed” in the post-regulatory analysis are considered to bear an impact.

Every projected closure has direct impacts on lost employment and output. These direct impacts have repercussions throughout the rest of the economy. The U.S. Commerce Department maintains an input-output model of the national economy. EPA uses the input-output multipliers for the iron and steel industry with the direct impacts to evaluate **secondary impacts** on the nation's economy as a whole. EPA used county or metropolitan statistical area unemployment data to examine the **regional** effects of each projected site closure.

EPA investigated the industry-wide **market and trade** effects of the regulation. EPA performed a 3-stage non-linear least-squares econometric estimation of a single-product translog cost model based on 20 years of U.S. Census and industry data. The market supply relationship is derived from the cost function and accounts for the effect of imperfect competition in the steel market. The model also incorporates

international trade. The model estimates the supply shift, and the resulting changes in: domestic price, domestic consumption, export demand, and import supply. The model results may be used to estimate a “cost pass-through” factor indicating the portion of the increased cost that the iron and steel industry can pass through to the customers.

ES.5 RESULTS

ES.5.1 Regulatory Options and Costs

Table ES-1 presents EPA’s proposed subcategorization of the industry while Table ES-2 summarizes the pollution control options considered for each subcategory. Table ES-3 lists the costs for each option. EPA selected two sets of options for co-proposal, see Table ES-4. Table ES-5 presents the costs for the co-proposed options to allow the reader to tie the EA (which is in terms of 1997 dollars) with the preamble to the proposed rule (which is in 1999 dollars).

ES.5.2 Impacts

Tables ES-6 and ES-7 summarize the impacts associated with the co-proposed options. Note that the aggregate subcategory costs do not close any additional sites beyond the one projected to close due to subcategory costs alone². EPA interprets the results of the subcategory and site analyses to indicate the viability of virtually all facilities as going concerns. One or more companies with a total of at least 14,000 employees experience financial distress predominantly because of the high capital costs associated with the

²EPA ran the closure model with and without the “cost pass-through” factor estimated by the market model. The results were the same for both sets of runs.

Table ES-1

Proposed Iron and Steel Manufacturing Subcategories and Segments

Subcategory		Segment
A.	Coke Making	By-product
		Other—Nonrecovery
B.	Ironmaking	Blast furnace
		Sintering
C.	Integrated Steelmaking Operations	
D.	Non-Integrated Steelmaking and Hot Forming Operations	Carbon & Alloy Steel
		Stainless Steel
E.	Integrated Hot Forming Operations, Stand-Alone Hot Forming Mills	Carbon & Alloy Steel
		Stainless Steel
F.	Steel Finishing Operations	Carbon & Alloy Steel
		Specialty Steel
G.	Other Operations	Direct Iron Reduction
		Briquetting (HBI)
		Forging

Table ES-2

Description of Regulatory Options by Subcategory

Subcategory	Discharge Status	Regulatory Option	Description of Regulatory Option
Cokemaking	Direct	BAT 1	# Tar Removal, ammonia stripping, and biological treatment with clarification # Liquid/solid separation and temperature control processes, where applicable
		BAT 2	# BAT 1 + cyanide and metals treatment with sludge dewatering
		BAT 3	# BAT 1 + two-stage alkaline chlorination
		BAT 4	# BAT 3 + granular activated carbon and filtration
	Indirect	PSES 1	# Tar removal, equalization, and ammonia stripping
		PSES 2	# PSES 1 + cyanide precipitation and mixed media filtration
		PSES 3	# PSES 1 + biological treatment with clarification
		PSES 4	# PSES 3 + two-stage alkaline chlorination
Ironmaking	Direct	BAT 1	# Solids removal, cooling tower, and high rate recycle # Metals precipitation, alkaline chlorination, and filtration for blowdown wastewater
	Indirect	PSES 1	# Solids removal, cooling tower, and high rate recycle # Metals precipitation and filtration for blowdown wastewater

Subcategory	Discharge Status	Regulatory Option	Description of Regulatory Option
Integrated Steelmaking	Direct	BAT 1	# Solids removal and high rate recycle # Cooling towers are necessary if a site employs vacuum degassing or continuous casting # Metals precipitation for blowdown wastewater
	Indirect	PSES 1	# Same as BAT 1
Integrated and Stand-Alone Hot-Forming (Carbon and Stainless Steel)	Direct	BAT 1	# Scale pit with oil skimming, roughing clarifier, filtration, cooling tower, and high rate recycle
	Indirect	PSES 1	# Same as BAT 1
Non-Integrated Steelmaking and Hot-Forming	Direct	BAT 1 (Carbon)	# Scale pit with oil skimming, filtration, cooling tower, and high rate recycle
		BAT 1 (Stainless)	# Scale pit with oil skimming, filtration, cooling tower, and high rate recycle
		BAT 2 (Stainless)	# BAT 1 + metals precipitation and filtration for blowdown wastewater
	Indirect	PSES 1 (Carbon)	# Same as BAT 1
		PSES 1 (Stainless)	# Same as BAT 1

Subcategory	Discharge Status	Regulatory Option	Description of Regulatory Option
Steel Finishing	Direct	BAT 1 (Carbon)	# Diversion tank, oil removal, hexavalent chrome reduction, equalization, metals precipitation, and sedimentation and sludge dewatering
		BAT 1 (Stainless)	# Diversion tank, oil removal, hexavalent chrome reduction, equalization, metals precipitation, sedimentation and sludge dewatering, and acid purification
	Indirect	PSES 1 (Carbon)	# Same as BAT 1
		PSES 1 (Stainless)	# Same as BAT 1
Other Operations	Direct	BAT 1 (DRI)	# Solids removal, clarifier, cooling tower, and high rate recycle # Filtration for blowdown wastewater
		BAT 1 (Forging)	# Oil/water separator
	Indirect	PSES 1 (DRI)	# Same as BAT 1
		PSES 1 (Forging)	# Same as BAT 1

Table ES-3
Regulatory Options Costs by Subcategory
(in Millions of \$1997)

Subcategory	Segment	Regulatory Option	Capital Costs	O&M Costs	One-Time Non-Equipment Costs	Post-Tax Annualized Costs	Pre-Tax Annualized Costs
Cokemaking		BAT 1	\$8.0	\$0.13	\$0.30	\$1.0	\$.93
		BAT 2	\$12.4	\$3.0	\$0.30	\$3.9	\$4.2
		BAT 3	\$34.4	\$5.3	\$0.30	\$6.9	\$8.6
		BAT 4	\$54.0	\$10.1	\$0.30	\$11.7	\$15.2
		PSES 1	\$0	\$0.29	\$0.15	\$0.24	\$0.29
		PSES 2	\$6.0	\$1.8	\$0.15	\$1.7	\$2.2
		PSES 3	\$18.6	\$3.3	\$0.20	\$3.9	\$5.0
		PSES 4	\$32.1	\$5.8	\$0.20	\$6.4	\$8.5
Ironmaking		BAT 1 and PSES 1	\$25.8	\$2.7	\$0.55	\$4.3	\$5.4
Integrated Steelmaking		BAT 1 and PSES 1	\$16.8	\$2.9	\$1.9	\$3.5	\$4.8
Integrated and Stand-Alone Hot-Forming	Carbon	BAT 1	\$111.8	\$15.6	\$0.97	\$20.4	\$27.5
		PSES 1	\$0.31	\$0.05	\$0.13	\$0.08	\$0.08
	Stainless	PSES 1	\$0.76	\$0.16	\$0.08	\$0.14	\$0.23
Non-Integrated Steelmaking and Hot-Forming	Carbon	BAT 1	\$18.3	\$1.9	\$3.7	\$2.7	\$4.0
	Stainless	BAT 1	\$0.41	\$0.06	\$0.21	\$0.07	\$0.11
		BAT 2	\$3.7	\$0.59	\$0.21	\$0.66	\$0.87
	Carbon	PSES 1	\$2.5	\$0.35	\$0.84	\$0.43	\$0.64
	Stainless	PSES 1	\$0	\$0	\$0.38	\$0.02	\$0.03
Steel Finishing	Carbon	BAT 1	\$14.2	\$1.9	\$1.6	\$2.8	\$3.4
	Stainless	BAT 1	\$15.2	(\$1.2)	\$0.69	\$0.24	\$0.20
	Carbon	PSES 1	\$6.0	\$1.2	\$0.83	\$1.6	\$1.8
	Stainless	PSES 1	\$4.0	\$0.24	\$0.39	\$0.36	\$0.56

Table ES-4

Summary of Cost Combinations

Subcategory	Segment	Discharge Status	Co-Proposal Options	
			A	B
Cokemaking		BAT	3	3
		PSES	1	3
Ironmaking		BAT	1	1
		PSES	1	1
Integrated Steelmaking		BAT	1	1
		PSES	No Regulation	No Regulation
Integrated Steelmaking and Hot-Forming	Carbon	BAT	1	1
		PSES	No Regulation	No Regulation
	Stainless	BAT	No Regulation	No Regulation
		PSES	No Regulation	No Regulation
Non-Integrated	Carbon	BAT	1	1
		PSES	No Regulation	No Regulation
	Stainless	BAT	1	1
		PSES	1	1
Steel Finishing	Carbon	BAT	1	1
		PSES	No Regulation	No Regulation
	Stainless	BAT	1	1
		PSES	No Regulation	No Regulation
Other Operations	DRI	BPT	1	1
		PSES	No Regulation	No Regulation
	Forging	BPT	1	1
		PSES	No Regulation	No Regulation

Table ES-5

Industry Costs
(in Millions)

	Cost Combinations	
	A	B
1997 Dollars		
Capital Costs	\$237.0	\$255.5
Operating and Maintenance Costs	\$29.4	\$32.4
One-Time Non-Equipment Costs	\$10.6	\$10.6
Post-Tax Annualized Costs	\$41.2	\$44.8
Pre-Tax Annualized Costs	\$54.3	\$59.0
1999 Dollars		
Capital Costs	\$246.5	\$265.7
Operating and Maintenance Costs	\$30.6	\$33.7
One-Time Non-Equipment Costs	\$11.0	\$11.0
Post-Tax Annualized Costs	\$42.8	\$46.6
Pre-Tax Annualized Costs	\$56.5	\$61.4

Note: Engineering News-Record Construction Cost Index 1997 = 5826, 1999 = 6059.

Table ES-6

Economic Impacts of the Proposed Regulation on Existing Sources

	Subcategory	Site	Firm
Direct Impacts			
Site Closures/ Corporate Financial Distress	1	1	1 or more
Direct Employment Losses	# 500	# 500	\$14,000
Community Impacts: Increase in Local Unemployment Rates			
Percentage Points	0.6	0.6	# 0.1 to 2.1
National Direct and Indirect Impacts			
Employees	# 500	# 500	
Output (\$ millions)	\$60	\$60	

Table ES-7

Market Impacts

Parameter	Cost Combinations	
	A	B
Pre-tax Annualized Cost (Millions, \$1997)	\$54.3	\$59.0
Supply Shift (annualized cost as a percentage of baseline price)	0.10%	0.11%
Domestic Price	0.08%	0.08%
Domestic Consumption	-0.11%	-0.12%
Domestic Production	-0.15%	-0.16%
Import Supply	0.11%	0.12%
Export Demand	-0.23%	-0.25%

hotforming pollution control option. The worst case assumption is that all the facilities would close. Under this assumption, regional unemployment increases by 0.1 percent to 2.1 percent. Given the viability of the individual sites, however, EPA expects that the company would respond to distress by selling assets. The sale of assets (such as a facility) may include the continued operation by the purchasing firm, resulting in limited job losses or secondary impacts.

The Agency evaluates the potential for foreign trade impacts by application of the market model. The aggregate regulatory compliance costs are incorporated to estimate the post-compliance impacts. If EPA finalizes one of the two sets of proposed options, the analysis indicates a 0.2 to 0.3 percent decrease in exports and a 0.10 to 0.12 percent increase in imports.

EPA projects that one small entity (a firm owning a single facility) may incur an impact such as facility closure/firm failure. Further, for small entities, EPA examined the cost to revenue ratio to identify any other potential impacts of the rule upon small entities. Under the more stringent set of options, EPA projects small entities will experience costs from 0 to 1.9 percent of revenues with 24 firms incurring no costs and three firms experiencing costs greater than 1 percent of revenues.